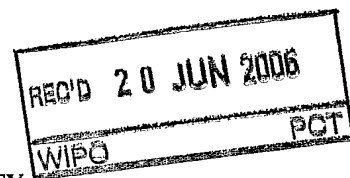


# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)



Applicant's or agent's file reference <b>6013-146PCT</b>	<div style="display: flex; justify-content: space-between;"> <span><b>FOR FURTHER ACTION</b></span> <span>See Form PCT/IPEA/416</span> </div>	
International application No. <b>PCT/CA2005/000337</b>	International filing date ( <i>day/month/year</i> ) 01 March 2005 (01-03-2005)	Priority date ( <i>day/month/year</i> ) 01 March 2004 (01-03-2004)
International Patent Classification (IPC) or national classification and IPC IPC: <b>B01D 61/42</b> (2006.01) , <b>C07B 63/00</b> (2006.01) , <b>B01D 61/14</b> (2006.01)		
Applicant <b>UNIVERSITÉ LAVAL ET AL</b>		
<ol style="list-style-type: none"> <li>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</li> <li>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</li> <li>3. This report is also accompanied by ANNEXES, comprising:               <ol style="list-style-type: none"> <li>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>4</u> sheets, as follows:                   <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).   <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. 1 and the Supplemental Box.                 </div> </li> <li>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s))  <div style="margin-left: 20px;"> , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).                 </div> </li> </ol> </li> <li>4. This report contains indications relating to the following items:               <div style="margin-left: 20px;"> <input checked="" type="checkbox"/> Box No. I Basis of the report  <input type="checkbox"/> Box No. II Priority  <input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability  <input type="checkbox"/> Box No. IV Lack of unity of invention  <input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement  <input type="checkbox"/> Box No. VI Certain documents cited  <input type="checkbox"/> Box No. VII Certain defects in the international application  <input type="checkbox"/> Box No. VIII Certain observations on the international application             </div> </li> </ol>		
Date of submission of the demand 21 December 2005 (21-12-2005)	Date of completion of this report 14 June 2006 (14-06-2006)	
Name and mailing address of the IPEA/CA Canadian Intellectual Property Office Place du Portage I, C114 - 1st Floor, Box PCT 50 Victoria Street Gatineau, Quebec K1A 0C9 Facsimile No.: 001(819)953-2476	Authorized officer  <div style="text-align: right;">Mark Hantke (819) 953-5773</div>	

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/CA2005/000337

## Box No. I Basis of the report

1. With regard to the **language**, this report is based on:
  - ☒ the international application in the language in which it was filed
  - ☐ a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
    - ☐ international search (Rules 12.3(a) and 23.1(b))
    - ☐ publication of the international application (Rule 12.4(a))
    - ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
  - ☐ the international application as originally filed/furnished
  - ☒ the description:
    - ☒ pages 1 to 37 as originally filed/furnished
    - ☐ pages\* received by this Authority on \_\_\_\_\_
    - ☐ pages\* received by this Authority on \_\_\_\_\_
  - ☒ the claims:
    - ☐ pages as originally filed/furnished
    - ☐ pages\* as amended (together with any statement) under Article 19
    - ☒ pages\* 38 and 39 received by this Authority on 21-12-2005
    - ☒ pages\* 40 and 41 received by this Authority on 29-05-2006
  - ☒ the drawings:
    - ☒ pages 1 to 23 as originally filed/furnished
    - ☐ pages\* received by this Authority on \_\_\_\_\_
    - ☐ pages\* received by this Authority on \_\_\_\_\_
  - ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
  - ☐ the description, pages \_\_\_\_\_
  - ☐ the claims, Nos. \_\_\_\_\_
  - ☐ the drawings, sheets/figs \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - ☐ the description, pages \_\_\_\_\_
  - ☐ the claims, Nos. \_\_\_\_\_
  - ☐ the drawings, sheets/figs \_\_\_\_\_
  - ☐ the sequence listing (*specify*): \_\_\_\_\_
  - ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/CA2005/000337**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

## 1. Statement

Novelty (N)	Claims	1 to 23	YES
	Claims	24 and 25	NO
Inventive step (IS)	Claims	1 to 23	YES
	Claims	24 and 25	NO
Industrial applicability (IA)	Claims	1 to 25	YES
	Claims	None	NO

## 2. Citations and explanations (Rule 70.7)

## 1. Reference is made to the following documents:

D1: CA2002816  
D2: US3905886  
D3: US4043896  
D4: US4123342

2. D1 discloses a process and device for separating electrically charged macromolecular compounds by force-flow membrane electrophoresis comprising an ultrafiltration membrane interposed between ion selective membranes. The solution to be treated is fed to one side of the ultrafiltration membrane and an electric field is applied across the assembly (see the whole document).

The apparatus of D1 would be suitable to perform all the functions of the system of claims 24 and 25 by adjusting the back pressure regulator to zero. Therefore claims 24 and 25 lack novelty and an inventive step with regards to D1 (Article 33(2) and (3)PCT).

3. D2 discloses a method for and apparatus for combined electrodialysis and ultrafiltration comprising an ultrafiltration membrane interposed between ion selective membranes. The solution to be treated is fed to one side of the ultrafiltration membrane and an electric field is applied across the assembly (see the whole document).

The apparatus of D2 would be suitable to perform all the functions of the system of claims 24 and 25 by adjusting the back pressure regulator to zero. Therefore claims 24 and 25 lack novelty and an inventive step with regards to D2 (Article 33(2) and (3)PCT).

4. D3 discloses a method for and apparatus for combined electrodialysis and ultrafiltration comprising an ultrafiltration membrane interposed between ion selective membranes. The solution to be treated is fed to one side of the ultrafiltration membrane and an electric field is applied across the assembly (see the whole document).

The apparatus of D3 would be suitable to perform all the functions of the system of claims 24 and 25 by adjusting the back pressure regulator to zero. Therefore claims 24 and 25 lack novelty and an inventive step with regards to D3 (Article 33(2) and (3)PCT).

5. D4 discloses a method for and apparatus for combined electrodialysis and ultrafiltration comprising an ultrafiltration membrane interposed between ion selective membranes. The solution to be treated is fed to one side of the ultrafiltration membrane and an electric field is applied across the assembly (see the whole document).

The apparatus of D4 would be suitable to perform all the functions of the system of claims 24 and 25 by adjusting the back pressure regulator to zero. Therefore claims 24 and 25 lack novelty and an inventive step with regards to D4 (Article 33(2) and (3)PCT).

6. None of D1 to D4 disclose operating the cell with no pressure differential between the cell compartments. Therefore claims 1 to 23 are novel and inventive (Article 33(2) and (3)PCT).

7. The subject matter of claims 1 to 25 have industrial applicability (Article 33(4)PCT).

**WE CLAIM:**

1. A process for separation or concentration of organic of at least one of neutral or charged compounds in a feed solution, said process comprising the steps of:

- a) passing at least once a feed solution containing neutral and charged organic compounds through an electrodialysis cell under electrical field, said electrodialysis cell comprising at least one charged membrane, and at least one filtration membrane, said cell being operated with no pressure differential between the cell compartments; and
- b) collecting separated fractions of permeate after passage of said neutral or charged compounds through said filtration membrane, each separated fraction containing separately neutral or charged compounds,

wherein an ionic solution circulates between said charged membrane and said filtration membrane on the side of the filtration membrane opposed to the side on which circulates the charged compounds containing feed solution, the charged compounds passing through said filtration membrane in the ionic solution during passage in the electrodialysis cell, and neutral compounds remaining in the feed solution.

2. The process of claim 1, wherein said electrodialysis cell comprises, at least one cationic membrane, at least one filtration membrane, and at least one anionic membrane on the side of the filtration membrane opposed to the side of the cationic membrane.

3. The process of claim 1, wherein pH of said feed solution is adjusted to preserve the charges of said compounds.

4. The process of claim 1 being a batch recirculation process.

5. The process of claim 1, wherein said neutral or charged organic compounds are separated simultaneously during performing the process.

6. The process of claim 1, wherein said filtration membrane is a cellulose ester ultrafiltration membrane.

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7. The process of claim 1, wherein said filtration membrane has a molecular weight cut off selected in the range of between 0.1 to 50 000 kDa.
8. The process of claim 1, wherein said filtration membrane is charged or neutral membrane.
9. The process of claim 1, wherein pH of said feed solution is of between 2 to 11.5.
10. The process of claim 1, wherein said compounds are of animal or vegetable origin.
11. The process of claim 1, wherein said compounds are physically, chemically or enzymatically hydrolyzed before performing step a).
12. The process of claim 1, wherein said composition flows through said electrodialysis cell at a rate of between 0.1 to 10 L/min., and said permeate at a rate of 0.1 to 150 L/min..
13. The process of claim 1, wherein said feed solution of step a) comprises neutral organic compounds.
14. The process of claim 1, wherein said passing of step a) is performed by continuous recirculation of the feed solution through the electrodialysis cell.
15. The process of claim 1, wherein said permeate is an aqueous solution or a salted solution thereof.
16. The process of claim 12, wherein said permeate comprises salts at a concentration between 0.01 to 10 g/L.

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17. The process of claim 1, wherein said feed solution comprises acid compounds having pH of below 5.0, neutral compounds having pH between 5.0 to 8.0, and basic compounds having pH over 8.0.
18. The process of claim 1, wherein where at least two filtration membranes are used to allow targeted molecular weight separation of said compounds in combination with charge separation.
19. The process of claim 1, wherein said electrodialysis cell comprises at least two filtration membranes, each filtration membrane having molecular weight cut-off different from the other or the others.
20. The process of claim 1, wherein said electrodialysis cell comprises at least one cationic membrane, at least one filtration membrane and at least one anionic membrane, each membrane being separately compartmented.
21. The process of claim 18, wherein pH in a compartment is different from pH of others compartments.
22. The process of claim 1, wherein said electrical field is pulsed.
23. The process of claim 1, wherein said electrical field comprises pulse periods of inverted electrical field.
24. A system for separation or concentration of organic charged compounds in a feed solution, said system comprising an electrodialysis cell comprising positive and negative electrodes apart thereof, and at least one charged membrane and at least one filtration membrane, both membranes being adapted one relatively to the other in order that an ionic solution circulates between said charged membrane and said filtration membrane on the side of the filtration membrane opposed to the side on which circulates the feed solution containing charged compounds, the charged compounds passing under

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electric forces through said filtration membrane in the ionic solution during passage in the electrodialysis cell, and neutral compounds remaining in the feed solution.

25. The system of claim 24, wherein said electrodialysis cell comprises, at least one cationic membrane, at least one filtration membrane, and at least one anionic membrane on the side of the filtration membrane opposed to the side of the cationic membrane.

**AMENDED SHEET**